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Finally the author succeeded in producing the "photisms" or "sound colors," by having the subject look at a gray disk on white paper, and describe the color effects he perceived as different forks were sounded—a very important contribution to the subject. The persons who see colors when they hear sounds, or *vice versa*, are thus only marked examples of a normal physiological reaction of one sense upon another.

While the author has here made an important contribution to an obscure field of research, much corroboration of his results will be necessary before they can stand as final; his special laxity is in regard to objective tests (many of which suggest themselves) of the real nature of these peculiar sensory associations. J. J.

*Neue Experimente über den Vorgang der einfachen Reaction auf Sinnes-eindrücke.* LUDWIG LANGE. Wundt's Philos. Studien, IV, 4, pp. 479-511.

The chief contribution of this paper consists in the introduction of a new distinction in the analysis of psychic processes. While various observers have called attention to the fact that the psychic process in a simple reaction time was not always the same, they regarded the differences as mainly due to the effects of practice and normal individual variations, and they sought by taking the average of all reaction times to get a single result true for the average individual. Lange, on the contrary, holds that there are normally two methods of reacting to a simple sensory stimulus, which he distinguishes as "motor" and "sensory." In the "motor" type one does not think of the sense impression, but has the attention focused upon the preparation of the motor reaction; while in the "sensory" type every tendency to get the motion ready is avoided, the attention being directed to the sensory impression entirely; when the impression is received the reaction is to follow as soon as possible. These two types are of course perfectly distinct only in their extreme forms, and can be studied only in individuals of steady and self-possessioned mental habits. Lange's object was to study the difference between "sensory" and "motor" reaction times in their extreme types. The sense impression was a sound preceded at a variable but controllable number of seconds by a "signal"; a further condition that seems to have worked admirably was the separation of operator and subject in different rooms and in communication by a telegraphic code. The interval between signal and stimulus was chosen for each individual at from one to three seconds according as seemed favorable to the quickest reactions. For three observers the average time of a reaction of the extreme "motor" type was .125, .137 and .123 second, while for the extreme "sensory" type it was .223, .224 and .230 second. The difference in time between the two is thus nearly .1 second, and the average variation of the several times from their mean is also larger in the "sensory" type. The "motor" is nearer the automatic stage, is probably less subject to individual and other fluctuations, while the "sensory" is nearer the conscious voluntary type of action. Furthermore, the reactions in anticipation of the sense impression never occur with the "sensory" type, but are difficult to avoid in "motor" reactions, because the point on which the attention is fixed tends to get first realized. Again, if a stimulus of an unexpected and totally different kind be given, it will always be reacted

upon by a "motor" subject, and will as regularly not be reacted upon by a person reacting in the "sensory" mode. Of Lange's acute theoretical analysis of these two activities only the main points can be here given.

Taking Wundt's well known scheme of the factors in a simple reaction, he concludes that in the "sensory" reaction with the attention fully on the alert, "apperception" and "perception" fuse into one process, while the "motor" reaction does not contain an apperceptive nor a voluntary factor, but is a psychic reflex in answer to a prepared setting of the voluntary apparatus. Anatomically the former process is in connection with the cerebrum, while reasons are given for associating the latter with the cerebellum.

This distinction of Lange's is very welcome, because it promises to reconcile the results of different observers; those who like Wundt naturally drift into the "sensory" mode of reacting, getting longer times than those who favor the motor type. Furthermore, the enormous effects of practice seem now explicable as the transition from the one mode of reacting to the other. J. J.

*Sul Tempo di Percezione dei Colori.* Drs. G. BUCCOLA and G. BORDONI-UFFREDUZZI. Rivista di Filosofia scientifica, Anno IV, Volume V, fasc. 1<sup>o</sup>, 1884.

This short paper gives the result of a series of careful experiments by two skilled experimenters upon the reaction time for different colors. They reacted, using the apparatus described by Buccola in his *La Legge del Tempo*, to the flash of a Geissler tube colored by the interposition of a plate of colored glass. They made their experiments from day to day at the same hour in the dark and excluded from the results any reactions that were disturbed by noise. These precautions, together with the skill and practice of the experimenters, give great regularity and consequent weight to their determinations. Red, blue, violet, and green were tested. The shortest average time was found for the last; but as this may have resulted from experimental conditions, it is not used for comparison with the others. Six series of thirty reactions each (fifteen for each observer, we judge) are given for each color. The average of the means of these is as follows:

	B.	BU.
Red,	0.153	0.160
Blue,	0.156	0.164
Violet,	0.161	0.168

In the quick perception of red they agree with Kunkel and with Ott and Prendergast. The authors suggest the advantage of study along the same lines on the evolution of the color sense and the determination of a psychometric spectrum to parallel the thermal, luminous and actinic spectra now distinguished. The subject of color perception is not without a certain practical side, since color figures so largely at present in railway and other signals. E. C. S.

*Ueber die Grenzen der Wahrnehmung passiver Bewegungen.* Dr. A. GOLDSCHIEDER. Centralblatt für Physiologie, No. 10.

Dr. A. Goldscheider here contributes a valuable series of observations upon the perception of passive movements. He enclosed the